WHAT IS CLAIMED IS:

1. A method for facet etching a semiconductor device to a target depth, the method comprising the steps of:

forming a first layer comprising an insulating material superjacent a substrate comprising a plurality of conductive structures, at least some of the conductive structures being placed apart to form spaces between the conductive structures, such that the first layer forms in at least some of the spaces between the conductive structures and the first layer is formed to a thickness at least equal to the target depth;

etching the first layer, in a first etch, by directing a plasma beam at the first layer formed in at least some of the spaces between the conductive structures, wherein the plasma is of sufficient energy to sputter material from the first layer and the plasma is an ion of an inert gas thereby forming a facet etch in the first layer formed in the spaces between the conductive structures;

terminating the first etch when the first layer has been etched to a predetermined depth which is less than the target depth;

etching the first layer, in a second etch, by contacting the first layer with a reactive chemical gas/plasma; and

terminating the second etch when the first layer has been etched to the target depth.

2. The method of Claim 1 wherein the first layer is formed by means of chemical vapor deposition.

3. The method of Claim 1 wherein the first layer comprises silicon dioxide or boron phosphosilicate glass.

4. The method of Claim 1 wherein the conductive structures form at least one of metal lines, interconnects and leads.

5. The method of Claim 4 wherein the conductive structures comprise at least one of titanium, tungsten, tantalum, molybdenum, aluminum, copper, gold, silver, nitrides thereof and silicides thereof.

6. The method of Claim 1 wherein the inert gas is at least one of helium, argon, xenon, krypton.

7. The method of Claim 1 wherein the plasma has an energy of about 300 to about 700 W.

8. The method of Claim 1, wherein the first etch is terminated at a depth no more than about 150 Å less than the target depth.

9. The method of Claim 1, wherein the first etch is terminated at a depth no more than about 100 Å less than the target depth.

10. The method of Claim 1 wherein the first etch is terminated at a depth about 50 Å less than the target depth.

11. A method for improving dielectric step coverage, the method comprising the following steps:

forming a first layer comprising an insulating material superjacent a substrate comprising a plurality of conductive structures, at least some of the conductive structures being placed apart to form spaces between the conductive structures, such that the first layer forms in at least some of the spaces between the conductive structures and the first layer is formed to a thickness at least equal to the target depth;

etching the first layer, in a first etch, by directing a plasma at the first layer formed in at least some of the spaces between the conductive structures, wherein the plasma is of sufficient energy to sputter material from the first layer and the plasma is an ion of an inert gas thereby forming a facet etch in the first layer formed in the spaces between the conductive structures;

terminating the first etch when the first layer has been etched to a predetermined depth which is less than the target depth;

etching the first layer, in a second etch, by contacting the first layer with a reactive chemical gas/plasma;

terminating the second etch when the first layer has been etched to the target depth, and

forming a second layer comprising an insulating material superjacent the first layer.

12. The method of Claim 11 wherein the second layer uniformly covers the first layer.

13. The method of Claim 11 wherein the first layer is formed by means of chemical vapor deposition.

14. The method of Claim 11 wherein the first layer comprises silicon dioxide or boron phosphosilicate glass.

15. The method of Claim11 wherein the conductive structures form at least one of metal lines, runners, interconnects and leads.

16. The method of Claim 15 wherein the conductive structures comprise at least one of titanium, tungsten, tantalum, molybdenum, aluminum, copper, gold, silver, nitrides thereof and silicides thereof.

17. The method of Claim11 wherein the inert gas is at least one of helium, argon, xenon, krypton.

18. The method of Claim 11 wherein the plasma has an energy of about 300 to about 700 W.

19. The method of Claim 11 wherein the first etch is terminated at a depth no more than 150 Å less than the target depth.

20. The method of Claim 11 wherein the first etch is terminated at a depth no more than 100 Å less than the target depth.

21. The method of Claim 11 wherein the first etch is terminated at a depth about 50 Å less than the target depth.

# MODIFIED FACET ETCH TO PREVENT BLOWN GATE OXIDE AND INCREASE ETCH CHAMBER LIFE


## ABSTRACT

A modified facet etch is disclosed to prevent blown gate oxide and increase etch chamber life. The modified facet etch is a two-stage process. The first stage is a plasma sputter etch to form a facet profile. The first stage etch is terminated prior to reaching the target depth for the etching process. The second stage etch is a reactive ion etch which directionally follows the facet profile to reach the target depth.